ever, that even this little may do some good, for it does seem hard, when the labours of men like Fritz Müller, Weismann, and Lubbock, are throwing light on this intricate subject, that darkness should return in the form of manifest misconceptions of well-known phenomena. B. T. LOWNE

99, Guilford Street, W.C.

Aspect

MR. LAUGHTON'S *aspect* is not only a felicitous word in relation to a plane, but it is susceptible of a wider application than that which he proposes for it, since it expresses a fundamental idea in the theory of surfaces. Every *surface* has at every point an *aspect*, which is the direction of a normal at that point. This may be regarded as the first property of surfaces, for if we define a surface as that form of extension which has at every part two and only two dimensions, we virtually say that, among all the directions in space that radiate from any point of the surface, there is one and only one perpendicular to all those (infinite in number) that lie within the surface at that point; in other words, that the surface has a normal at every point. A plane is then a continuous surface which has *the same aspect throughout*, the angle of two planes is the measure of *their difference in respect of aspect;* parallel planes (as Mr. Wilson points out) are those which have *the same aspect*, a plane tangent to a surface is one which contains a point of the surface, and has *the aspect of the surface at that point*, and a line tangent to a surface is one that contains a point of the surface, and has *a direction which lies within the surface* (or is perpendicular to the normal) *at that point.* Then *a straight line tangent to a plane lies wholly in the plane*, and if such a line, passing through any assumed point of a plane—rotate about that point—always remaining tangent to the plane, it must sweep *every point of the plane*, for it will generate a continuous and infinite surface coincident throughout its extent with the plane, and the plane, being continuous, can have no points without this surface. Therefore, *a straight line which joins two points of a plane lies wholly in the plane*, whence the propositions that *a plane is determined by three points*, and that *the intersection of two planes is a straight line*, together with the other elementary theorems of the geometry of space, are readily derived.

The use of *aspect* in the sense now proposed is not absolutely new, as Mr. Proctor (NATURE for October 26) seems to argue. It has the high authority of Sir W. R. Hamilton in his "Lectures on Quaternions" (1853). Thus we read on page 92 (the italics and capitals of the original are preserved):—"A biradial has also a PLANE and an ASPECT, depending on the *star* or *region* of infinite space, towards which its plane may be conceived to FACE. . . . When two bi-radials have, in the sense just now explained, the *same aspect*, their planes both facing at the same moment the *same star*, they may be said to be CONDIRECTIONAL BIRADIALS. When, on the other hand, they face in exactly *contrary* ways, and, therefore, have OPPOSITE ASPECTS, they may be called CONTRADIRECTIONAL. . . . Both these two latter classes may be included under the common name of PARALLEL BIRADIALS, so that the PLANES of any two *parallel biradials* are either coincident or parallel."

Vaguely, indeed, *aspect of a plane* may be used in the sense Mr. Proctor would assign it, as well as in several other senses. But if we could give it an exact and technical signification, that which is proposed by Mr. Laughton seems to issue directly from the proper meaning of the word; and it is a signification which no other word yet suggested will so easily bear. At present, therefore, it ought to be accepted as the very word that is needed in the re-construction of geometry.

As for *position*, it is pertinent to ask whether anyone would say that parallel planes have *the same position.* The attribute of planes, for which a word is demanded, is precisely that *element* of position in which parallel planes agree; and the *position* of a plane requires for its determination not that element only, but also some other element whereby the plane shall be distinguished from its parallels.

Permit me, by way of appendix to my too long note, to call the attention of those who are interested in the *early* teaching of Geometry, which has lately been discussed in your columns, to Dr. Thomas Hill's "First Lessons in Geometry. Facts before Reasoning." (Boston, 1856.)

J. M. PEIRCE

Cambridge, Massachusetts, Nov. 15

Cause of Low Barometric Pressure

IN the number of NATURE for July 20, 1871, I find a paper by Ferrel, "On the Cause of Low Barometer in the Polar Regions," &c. The author says that the law which deflects a body to the right in the northern hemisphere and to the left in the southern is not understood by meteorologists, and that it is admitted only when the movement is north and south.

I believe this law is now admitted by almost all meteorologists. The proof of it is the general acceptance of Buys Ballot's law of winds, which states that the wind will always blow towards a barometrical depression, and be deflected to the right in the northern hemisphere.

The most important meteorological works of the last years are based on this principle, as, for example, Buchan's "Mean Pressure and Prevailing Winds," and Mohn's "Storm Atlas." Mr. Mohn states the error which was committed in former times, and gives the expression of the deflecting force (page 17).—15°. sin L. (latitude) per hour. As to Mr. Ferrel's explanation of the low barometer at the poles, I must first state that it is not lowest near the poles. In the northern hemisphere, the lowest pressures are near Iceland and near the Aleutian islands, but northwards they are higher, as the observations of Greenland have shown, as is seen also in the prevalence of N.E. winds in winter at Stykkissholm (Northern Iceland); this would indicate that the pressure to the north and north-west of the last place is higher.

The great barometric depressions which so often visit Iceland cannot exist at temperatures of some degrees below freezing point. This explains why the barometer cannot be lower at the Arctic Pole than near Iceland in winter; the temperature there must be certainly much lower, even if the pole be surrounded by open water.

It is the low temperature also that explains the course of the Atlantic storms across European Russia (from N.W. to S.E.), as the winter temperature of Siberia is too low to admit the storms. This was already stated by Mr. Mohn, and I can but confirm his opinion.* In southern latitudes the barometrical depression seems to increase towards the pole, but do we know enough of these regions to say that the lowest barometer will be at the pole? In the highest southern latitudes attained by Sir James Ross the barometer was a little higher than northward. All that we know about the origin and propagation of barometrical depressions gives us the right to say that pressure cannot be lowest at the south pole, but that, as in the northern latitude, the greatest depression will be found at some distance from the pole, perhaps as far as the Antarctic Circle.

St. Petersburg, November 28 A. WOJEIKOFER

Symbols of Acceleration

I WISH to direct the attention of the reviewer of the "New Works on Mechanics," in No. 107 of NATURE, to the following statements which he makes while speaking of Wernicke's book:—"The symbol j is here and throughout the work used to denote an acceleration; for example $j\ x$ (*sic*) is the acceleration parallel to the axis of x. This notation (unfamiliar to English readers) has obvious advantages when the more appropriate language of the differential calculus cannot be employed."

Now I cannot see how the notation is "infamiliar to English readers," when we have in common use α to denote an acceleration, and α_x an acceleration parallel to the axis of x. Again, though I agree with the reviewer that j_x (or the English α_x) "has obvious advantages when the more appropriate language of the Differential Calculus cannot be employed," yet it should be remembered that there is a more appropriate notation still, viz., that of Newton's Fluxions, recalled to its proper position in mixed mathematics by Sir W. Thomson (see Thomson's and Tate's "Nat. Phil.") and beginning to spread, in which $\frac{d^2 x}{d t^2}$ or an acceleration parallel to the axis of x is denoted by $\ddot{x}$. This notation can be employed at all stages of the student's progress, for it is as easy for him to learn that acceleration parallel to the axis of z, actual acceleration in the path, &c., are denoted by $\ddot{z}$, $\ddot{s}$, &c., as to make himself acquainted with Wernicke's symbols. Afterwards, when studying the Differential Calculus, he may be told the name of the notation, and have his knowledge of it enlarged, but he will never need to unlearn it; on the contrary, he will

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* See also my paper "On Barometrical Amplitudes," in the *Journal of the Austrian Meteorological Society*, 1871, No. 10.

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find its service increase in importance as he makes his way into the highest parts of the subject.

Of course no attempt is here made to attack D-ism, but to state that it and Dot-ism have their proper spheres, the latter generally, with more or less appropriateness, throughout the whole realm of functions, the former in the realm of motion, where the functions are functions of *t*—the sway over which realm was originally given to it by Newton, and acknowledged, as I have been told, by the D-ist Lagrange.

Glasgow College THOMAS MUIR

Occurrence of the Eagle Ray

A DOUBLE-SPINED specimen of the eagle ray (*Myliobatis aquila*), taken in Torbay on the 1st Nov., has been presented to this museum by Mr. Frank Gosden, fish dealer, High Street, Exeter. Its dimensions are as follows:—Breadth across the fins, 2ft. 3½in.; length from snout to the base of the spines, 1ft. 7¾in.; total length from snout to extremity of the tail, 3ft. 6½in. W. S. M. D'URBAN, Curator

Albert Memorial Museum, Exeter

Deep Sea Dredging

WHILE winter allows of time for complete arrangements to be made in anticipation of dredging weather, will you permit me to raise the question of the conditions under which our knowledge of the natural history of the sea may be most readily extended?

As a rule, yacht owners object to the fatigue and dirt of dredging, but as we have the successful example of the *Norna*, may we not hope that other yachts may further the cause of science, if assistance in the way of instruction or apparatus be afforded to them by those having the necessary experience and means?

The idea of now urging the question is not mine alone, but is entertained by many ardent naturalists who are much in favour of a skilful search of our seas at home, as well as of the Mediterranean and other distant and almost untried seas.

Your pages have often borne witness to the interest and importance attaching to marine zoology, and if men of practical experience, such as Carpenter, W. Thomson, Marshall Hall, &c., will indicate the best localities for search and the best measures to adopt, we may hope that others may follow in their steps, and that the large aquaria now built and building will be supplied, as only private zeal and enterprise can compass, with new and rare specimens from deep waters.

T. H. HENNAH

Milton House, Clarence Street, Brighton, Dec. 5

The Solar Halo

THE solar halo of the morning of the 13th ult. described in your last number as seen near, and at about thirty miles from, Durham, and which Prof. A. S. Herschel conjectures may have been seen from more distant stations, was visible here.

I first saw it at about 8 A.M., when it appeared as the arc of a circle, with a very short portion of an inverted arc touching it at the vertex—the sun itself being hidden by a bank of cloud, from behind which issued several radiating spikes. Shortly after half-past nine this halo had disappeared, except a small portion at the point of contact of the two arcs, vertically over the sun, which appeared like a bright elongated patch, forked at each end, and projected not on mist, but on blue sky, and tinged with dull prismatic colours, which were most strongly marked in the inverted arc, in which the red or orange was downwards, or on the outside of the circle. I then suddenly caught sight of a second halo, of much greater radius than the first—visible through perhaps 130° or 140° of arc, above, and to the right of, the sun, projected on the clear blue sky, but so faintly that it might easily have been missed. This outer circle exhibited the prismatic colours with a purity and delicacy that I have never before seen in halos, and which was quite different to the ordinary dull, muddy colours. In fact, it had just the appearance of a very faint and *narrow* rainbow, the red being inside, and the blue outside the circle. I was shortly after able to borrow a sextant, and measured the distance from the sun to the bright patch and the outer circle, which appeared respectively 21° 40' and 43° 20'; but they were already growing so faint that I was unable to do this with much precision. Except the bright patch before named, I did not observe any appearance of "mock-sun."

Cardiff, Dec. 4 GEO. C. THOMPSON

ON THE ZIPHIOID WHALES

THE peculiar division of Cetaceans to which the term "Ziphioid" is now commonly applied, from one of the earliest known forms, *Ziphius* of Cuvier,[*] is in many respects one of the most interesting of the order. They form a very compact group, united closely together by the common possession of very definite structural characters, and as distinctly separated from all other groups by equally definite characters.

With the singular exception of *Hyperoodon rostratus* (the structure and habits of which species are as well known, perhaps, as those of any other cetacean), no specimen of the group had ever come under the notice of any naturalist up to the commencement of the present century. Since that time, however, at irregular intervals, in various and most distant parts of the world, solitary individuals have been caught or stranded, now amounting to nearly thirty, these being by some naturalists referred to upwards of a dozen distinct species and to very nearly as many genera. No case is recorded of more than one of these animals having been observed at one place at a time, and their habits are almost absolutely unknown. Their very presence in the ocean seems to pass unnoticed and unsuspected by voyagers, and even by those whose special occupation is the pursuit and capture of various better known and more abundant cetaceans, until one of the accidental occurrences just alluded to reveals the existence of forms of animal life of considerable magnitude, and at least sufficiently numerous to maintain the continuity of the race.

This comparative rarity at the present epoch contrasts greatly with what at one time obtained on the earth, especially in the period of the crag formations, and leads to the belief that the existing ziphioids are the survivors of an ancient family which once played a far more important part than now among the cetacean inhabitants of the ocean, but which have been gradually replaced by other forms, and are themselves probably destined ere long to share the fate of their once numerous allies or progenitors.

The Ziphioid whales belong to the great primary division or sub-order of the Odontocetes or Toothed whales, as distinguished from the Whalebone whales. They are allied on the one hand to the Cachalots or Sperm whales, and on the other to the true Dolphins and Porpoises, but more nearly to the former than the latter. They are animals varying between fifteen and thirty feet in length, and in external characters very closely resemble each other, all having small pointed snouts or "beaks," small rounded or oval pectoral fins or "flippers," a comparatively small triangular dorsal fin, situated considerably behind the middle of the back, and a single "blowhole" of concentric form, situated in the middle of the top of the head. One of their most obvious characteristics, distinguishing them from the true dolphin, is the complete absence of teeth (except occasionally a few mere rudiments concealed in the gum) in the upper jaw, while in the lower jaw there is usually but a single pair, which in some species may be greatly developed and project like tusks from the mouth, though sometimes even these are rudimentary and covered up by the gum, so that the animal is practically toothless. In addition to these external and easily-recognised characters, there are others connected with the skeleton and internal organs which separate them still more trenchantly from the other members of the order. Their food appears

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[*] "J'appliquerai au genre dont elle (a skull found on the shore of the Mediterranean) devient le premier type, le nom de Ziphius, employé par quelques auteurs du moyen age (Voyez Gesner I., p. 209) pour un cétacé qu'ils n'ont point déterminé" (Cuvier, "Ossemens fossiles"). According to strict rules of priority "Hyperodontoid" would be the more correct term, as Hyperoodon was the first genus of the group distinctly characterised; but as the name is erroneous in its signification, it will be better to keep to the more generally adopted and less objectionable term of "Ziphioid," first applied by Gervais. The group is equivalent to Eschricht's "Rhynchoceti."

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